Continuous Dynamic Grid Adaptation In a Global Atmospheric Model - Progress

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GOALS

1. Advance general coordinate transformation techniques for continuous dynamic grid adaptation (CDGA) in non-oscillatory, forward in time (NFT) modeling
2. Produce global static adaptive-grid and then CDGA atmospheric climate models.

Working toward goals by combining mathematical rigor …

e.g., Geometric Conservation Law ⇒ ⇒ ⇒ yields identities for numerics that

$$\frac{G}{\overline{G}}\frac{\partial}{\partial \overline{x}^s}\left(\frac{\overline{G}}{G}\right) \equiv -\frac{\partial}{\partial \overline{x}^q}\left(\frac{\partial \overline{x}^q}{\partial x^s}\right)$$

(q,s = 0,1,2,3)

(Prusa & Gutowski, IJNMF, 2006)

- **minimize numerical error**
- **extract appropriate forms of circulation diagnostics**
- **promote using limited-area domains (step-function boundaries)**
- **set stage for dynamic stretching**

… with global atmospheric model applications

CAM3 physics coupled to EULAG dynamics

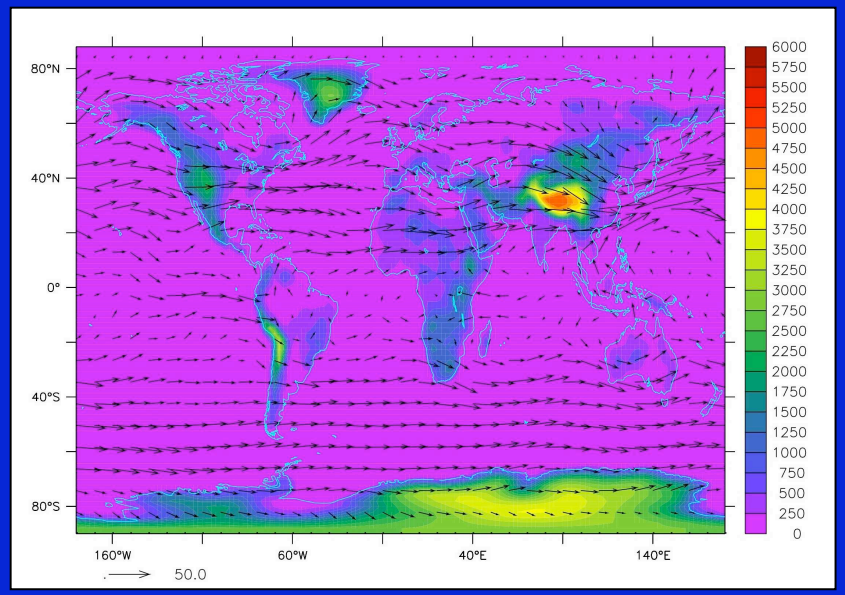
- **Nonhydrostatic, deep moist anelastic approx.**
- **Grid adaptivity via continuous transformation of coordinates**
- **MPDATA (Non-oscillatory Forward in Time) advection**

Applied to aqua-planet simulation & AMIP-II simulation

Feb. 1979

200 hPa horizontal wind vectors

+ topography



Time average U [m/s]